

# Globalisation and Economic Growth in the Third World: Some Evidence from Eighteenth-Century Mexico\*

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*Abstract.* This article studies the connection between globalisation and economic growth in eighteenth-century Mexico. This was a period of globalisation in Mexico, characterised by market integration and growth in international trade. I estimate economic growth at that time and explore its relationship with the dominant export of the epoch, silver. The results show that Mexico experienced rapid economic growth in the eighteenth century and, furthermore, that exports caused that growth. During the period of Bourbon reforms economic growth improved, but not dramatically. Mining ceased to be the engine of growth by the end of the century.

## *I. Introduction*

The New Spain of 1800 was radically different from the modest colony of 1700. Population underwent very impressive growth compared to the seventeenth century, when it did not grow at all. In 1800 it was 2.7 times greater than a century before. More strikingly, the eighteenth century saw a new mix of Spaniards and Indians become the predominant class. The economy also grew, and New Spain was progressively integrated into the world economic system. Silver production, the colony's predominant export, was multiplied by an impressive factor of 4.5 between 1700 and 1800. But by the end of the eighteenth century, inequality was formidable. This was a century of remarkable change and reform, of efficiency and globalisation.

Economic growth in the eighteenth century has been a major topic in the historiography of colonial Mexico. Traditionally, the historiography has depicted the existence of the colony just for the benefit of the mother country.

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Spain followed an economic policy of mercantilism in which accumulation of specie in the New World was encouraged and other areas of production were limited. New Spain, in this sense and others, was very much restricted by the imperial system. As a consequence, the growth of industry and commerce was probably impeded. However, such a view of the colonial economy is going to be challenged in this essay. I will show that the eighteenth century was a period of rapid growth for colonial Mexico, and that globalisation and mercantilism were behind this phenomenon.<sup>1</sup>

The past decade has seen important advances in our understanding of the causes and consequences of globalisation in nineteenth- and twentieth-century industrialised OECD countries.<sup>2</sup> Historical convergence or divergence in the standards of living among the members of the Atlantic economy is now impossible to understand without reference to its corresponding period of globalisation or disintegration. However, much less is currently known about the impact that globalisation has had on the Third World.<sup>3</sup> This paper represents one effort to understand the connection between globalisation and economic growth in the periphery, eighteenth-century Mexico. The paper offers economic growth estimates for colonial Mexico (New Spain) during one of its periods of globalisation, and finds that there was rapid economic growth in that period.<sup>4</sup> The article also argues that all of that per capita growth was pushed by the dominant export of the epoch, silver.<sup>5</sup>

Globalisation is characterised by market integration and the growth of international trade, phenomena not new to Latin America. Globalisation has

<sup>1</sup> There are two other important topics in the economic historiography of eighteenth-century Mexico that will not be studied in this article. The first is the evolution of inequality during the century, and the second is the spatial and class differences of any possible growth in the aggregate.

<sup>2</sup> See Jeffrey G. Williamson, 'Globalization, convergence and history,' *Journal of Economic History*, vol. 56 (1996), pp. 277–306; Kevin H. O'Rourke and Jeffrey G. Williamson, *Globalization and History. The Evolution of a Nineteenth-Century Atlantic Economy* (Cambridge, 1999).

<sup>3</sup> See Kevin O'Rourke and Jeffrey G. Williamson, 'After Columbus: Explaining Europe's Overseas Trade Boom, 1500–1800,' *Journal of Economic History*, vol. 62, no. 2 (2002), pp. 417–456; Jeffrey G. Williamson, 'Land, Labor and Globalization in the Third World, 1870–1940,' *Journal of Economic History*, vol. 62, no. 1 (2002), pp. 55–85. On Latin America, see also Victor Bulmer-Thomas, *The Economic History of Latin America since Independence* (New York, 2003); John H. Coatsworth and Jeffrey G. Williamson, 'The Roots of Latin American Protectionism: Looking before the Great Depression,' *NBER Working Paper 8999* (Cambridge, 2003); and Luis Bértola and Jeffrey G. Williamson, 'Globalization in Latin America before 1940,' *NBER Working Paper 9687* (Cambridge, 2003).

<sup>4</sup> A more ambitious goal would be to compare directly the economic growth of this century of globalisation to the growth of the period of disintegration in the early nineteenth century. But this requires a much larger effort in estimating economic growth in the later period.

<sup>5</sup> This does not mean there was no investment in the economy, but rather that it was related to exports.

taken place four times in the post-Columbian era of Latin America, and Mexico took part in all of them. The first began just after the Spanish conquest of Native Americans in the Valley of Mexico (1521), and it probably culminated in the early seventeenth century with a substantial decline in population due to several factors, including the exposure of the native population to Old World epidemics.<sup>6</sup> The second period of globalisation, on which this article focuses, began around 1690 and it spread throughout the eighteenth century. In this period Mexico saw an unprecedented boom in silver production. Private firms extracted the silver, most of which was then coined by the government mint. After coinage, the government returned the coined silver to private producers, except for taxed amounts. Colonial Mexican silver, after circulating in domestic markets, was used to finance foreign imports.<sup>7</sup>

The connection between globalisation and economic growth studied in this article is the following. The integration of colonial Mexico into European markets through the ports of Spain was a channel that allowed the economic growth of Mexico by means of export-led growth. In measuring this economic growth, real wages and living standards ought to be given a key place, as has been the case in the economic historiography.<sup>8</sup> However, evidence on wages for eighteenth-century Mexico is very scarce. What is available is a series on government income, which can be used to estimate economic growth as a proxy of aggregate GDP.

Export-led growth encapsulates the idea that the rate of productivity growth, the rate of accumulation and the rate of employment are positively related to the rate of growth in aggregate demand. Therefore, a boom in exports pushes total economic activity. Equally, a country's expansion may be restricted by a balance of payments constraint, a boost in exports promoting investment and growth. Forward and backward linkages have also been key elements in any explanation of export-led growth. In the Mexican case, the economic historiography has documented the rise of cities around mining centres and their connection across space.

The current economic historiography has two competing views on the economic growth of eighteenth century Mexico. A traditional perspective sees significant economic growth in this period of globalisation, as signalled by the growth of government income and silver production, and characterised by the expansion of trade, industry, population and the

<sup>6</sup> See John H. Coatsworth, 'Cycles of globalization, economic growth, and human welfare in Latin America,' in Otto T. Solbrig, Robert Paarlberg and Francesco di Castri (eds.), *Globalization and the Rural Environment* (Cambridge, 2001).

<sup>7</sup> Some small fraction of silver inevitably remained in colonial Mexico serving as money.

<sup>8</sup> O'Rourke and Williamson, *Globalization and History*.

cities.<sup>9</sup> The new view questions the magnitude of that growth. John Coatsworth<sup>10</sup> guesses that per capita output in New Spain was the same at the beginning and at the end of the eighteenth century. Furthermore, when comparing the eighteenth century development of colonial Mexico with the colonial British America, the new view holds that Mexican productivity did not compare favourably, and that institutional obstacles impeded productivity growth in Mexico.<sup>11</sup>

In order to estimate the economic growth of eighteenth-century Mexico, I construct an index for total output by using fiscal income in the treasury of Mexico City as published by John TePaske.<sup>12</sup> First, I estimate the share of this income in total fiscal income for New Spain from the decade-based averages of New Spain's fiscal income presented by Herbert Klein (1998).<sup>13</sup> Next, I construct a price index for non-tradable goods from the maize price in New Spain published by Richard Garner.<sup>14</sup> The non-tradable price index is obtained by assuming that changes in the price of non-tradable goods are proportional to changes in the maize price.<sup>15</sup> Finally, in order to connect the behaviour of total output to government income, I explore a specific relationship between total fiscal income as a share of total output

<sup>9</sup> Enrique Florescano and Margarita Menegus, 'La época de las reformas borbónicas y el crecimiento económico (1750–1808),' in *Historia General de México, Versión 2000* (Mexico City, 2000); Manuel Miño, *El mundo novohispano: población, ciudades y economía, siglos XVII y XVIII* (Mexico City, 2001).

<sup>10</sup> John H. Coatsworth, 'Economic and Institutional Trajectories in Nineteenth-Century Latin America,' in John H. Coatsworth and Alan. M. Taylor (eds.), *Latin America and the World Economy since 1800* (Cambridge, 1998).

<sup>11</sup> Stanley L. Engerman and Kenneth Sokoloff, 'Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies,' in S. Haber (ed.), *How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800–1914* (Stanford, 1997), link the differences in institutions between Latin America and British America to differences in factor endowments and inequality. Daron Acemoglu, Simon Johnson, and James A. Robinson, 'The Colonial Origins of Comparative Development: An Empirical Investigation,' *American Economic Review*, vol. 91, no. 5 (2001) attempt to estimate the effect of institutions on economic performance for a large number of countries.

<sup>12</sup> John J. TePaske, 'Economic Cycles in New Spain in the Eighteenth Century: The View from the Public Sector,' in Richard L. Garner and William B. Taylor (comps.), *Iberian Colonies, New World Societies: Essays in Memory of Charles Gibson*, private publication, pp. 119–42 (1985).

<sup>13</sup> Herbert S. Klein, *The American Finances of the Spanish Empire: Royal Income and Expenditures in Colonial Mexico, Peru and Bolivia, 1680–1809* (Albuquerque, 1998). For in-depth analysis of the structure of government income in colonial Mexico, see this and Carlos Marichal and M. Carmagnani, 'From Colonial Fiscal Regime to Liberal Financial Order, 1750–1912,' in Michael D. Bordo and Roberto Cortés-Conde (eds.), *Transferring Wealth and Power from the Old to the New World* (New York and Cambridge, 2001).

<sup>14</sup> Richard L. Garner with Spiro E. Stefanou (1993), *Economic Growth and Change in Bourbon Mexico* (Gainesville, 1993).

<sup>15</sup> An assumption is required to relate changes in the maize price to changes in the price level, and the one I follow here appeals with its simplicity. Currently, there is not enough evidence in the economic historiography to attempt its empirical justification.

and two possible variables: the share of silver in total output, and per capita output. As a special case, I also explore the implications of assuming that the share of fiscal income in total output did not vary throughout the eighteenth century.

By offering economic growth estimates for eighteenth century New Spain, I am able to establish whether there was some positive per capita growth in eighteenth century New Spain. Furthermore, I seek to analyse if this economic growth was pushed by the principal export of the epoch: silver. I also explore the possibility that New Spain established its own dynamics of sustained economic growth, with this growth not being related to silver production. And finally, the article studies the effect that Bourbon reforms may have had on economic growth on the post-1769 period. Bourbon reforms encompassed political and economic changes in New Spain, but in this article I refer simply to the incentives implemented after 1765 to reanimate silver production.

In stark contrast to the economic stagnation economic historians have found in seventeenth and the first half of nineteenth century, this article finds rapid economic growth in the eighteenth century period of globalisation for Mexico.<sup>16</sup> If I assume a one per cent annual population growth rate for eighteenth-century Mexico, as has been concluded by the modern demography of New Spain, I conclude there was positive per capita growth. This means that all of the Mexican per capita growth in the two and a half centuries between 1600 and 1860 can be found in the eighteenth century, and this growth is related to globalisation.

I find that the periods of high economic growth in eighteenth-century New Spain coincide with periods of mining expansion. If I assume a one per cent population growth rate for the eighteenth century, then the estimated per capita growth rate in the periods of mining stagnation was near zero, whereas all per capita growth in eighteenth-century Mexico occurred during the periods of mining expansion. It is likely there would have been no per capita growth in New Spain without growth in mining. The economic growth estimates also suggest that colonial Mexico failed to establish its own dynamics of sustained economic growth.

With regard to the period of Bourbon reforms, I find there could have been only a slight increase in the rate of economic growth during the last 30 years of the eighteenth century. However, diminished economic growth during this period is equally likely. This means that even though economic growth may have improved during the period of Bourbon reforms, it seems

<sup>16</sup> See John J. TePaske and Herbert S. Klein (1981), 'The Seventeenth-Century Crisis in New Spain: Myth or Reality?', *Past and Present*, no. 90 (1981), pp. 116–35; and John H. Coatsworth, 'La historiografía económica de México,' *Revista de Historia Económica*, vol. 4, no. 2 (1988), pp. 277–91.

that the reforms themselves did not have the success we may have expected. Economic growth may have improved only slightly, in comparison to the growth observed during the periods of mining expansion during the first half of the century. By the end of the eighteenth century, mining ceased to be the force promoting economic growth.

This article is organised in five sections. Section II reviews the two methods that have been used by the economic historiography to track total output in New Spain. One is based on available series on mining output, the other one on government income. The section also serves to introduce some of the problems and academic discussions that the use of these methods has awakened. Section III proposes a modification to one of those methodologies to tackle the problems involved in the estimation of economic growth in eighteenth century Mexico. It presents the methodology used in this article to estimate an index for total output from a series on government income. Section IV provides the estimated output index and the results of this article. The article concludes with final comments in section V.

## *II. Review of the historiography*

This section reviews two approaches that have been used in the economic historiography in order to track the level of economic activity in New Spain. The first studies the behaviour of silver production, and it tries to deduce the behaviour of output from the observed behaviour of silver. The second studies government income in New Spain and assumes this income did not vary as a share of total output in New Spain.

Output estimates for pre-modern economies usually depend on some assumptions about the economic structure of those economies. With regard to New Spain, we know the Spanish crown was interested in establishing an American colony in order to sustain its own economy. New Spain's economic structure by the beginning of the eighteenth century has been described by Stanley J. Stein and Barbara H. Stein,<sup>17</sup> who argued that Spaniards spent some two hundred years to establishing an economy linked to Spain. By 1700 there had been established in Spanish America a series of mining centres in Mexico and Peru, creating agricultural regions for their provisioning, and a commercial system to export the silver to Europe.

This picture of the colonial economy in which the level of mining output determines aggregate economic activity has been supported by the work of several historians. Some have showed that non-mining economic activity developed around the sixteenth- and seventeenth-century mining

<sup>17</sup> Stanley J. Stein and Barbara H. Stein, *The Colonial Heritage of Latin America: Essays on Economic Dependence in Perspective* (New York, 1970).

centres in Latin America. Theoretically, it is possible that the reduced form equation:

$$Y_t = \rho \cdot X_t \quad (1)$$

could be an apt description of New Spain's economy, where  $Y_t$  is total output in colonial Mexico, and  $X_t$  represents the output of silver. This Equation 1 simply states that total production in New Spain is proportional to silver production.<sup>18</sup> If correct, Equation 1 could allow us to track the behaviour of total output in New Spain by studying available data on silver production. That is, the rate of economic growth in colonial Mexico would be equal to the rate of growth of silver production. Equation 1 can be derived from several models, and depending on the theoretical background we assume, we must take a decision on whether or not to deflate silver production in order to estimate total output in real terms. The appendix of this paper offers two simple models: one suggests we should deflate silver production, the other suggests the opposite.

Equation 1 has played an important role in the economic historiography of colonial Mexico in order to track the behaviour of total output. Up to what point it would be correct to apply this description of New Spain's economy to the entire eighteenth century? Manuel Miño<sup>19</sup> has recently summarised the results of the past 25 years of economic historiography, and he suggests that the theoretical framework embodied in Equation 1 could be incorrect sometime in the eighteenth century. The different regions of New Spain are neither peripheral, nor do they only provide the mining centres with goods. Miño argues that during the eighteenth century, new centres of economic activity emerged to provide merchandise not to the mines, but to Mexico City and other urban centres. Furthermore, although at the end of the eighteenth century textile output continued to depend on mining activities, this was now because unemployed labour in mining centres contributed to the production of textiles. As a result, resources moved from one sector to another, and not just between regions. The population was distributed across New Spain's regions following an economic specialisation.

A second approach has been used in the colonial historiography of Mexico in order to track the aggregate level of economic activity. This alternative method received renewed interest due to the data on government income that John TePaske and Herbert S. Klein.<sup>20</sup> In studying New Spain's total output, the point of departure is total government income in New

<sup>18</sup> Equation 1 is far from stating that the colonial economy consisted only of mining. In fact, the presumption here is that  $\rho$  is a number much larger than one, perhaps between six and twelve. On this, see Appendix.

<sup>19</sup> Miño, *Mundo novohispano*.

<sup>20</sup> John J. TePaske and Herbert S. Klein, *Ingresos y egresos de la Real Hacienda en Nueva España* (Mexico City, 1986).

Spain, *I*. Let us define  $\pi$  as the share of government income in total output in New Spain, so that total output in colonial Mexico is given by:

$$Y_t = \frac{I_t}{\pi_t} \quad (2)$$

Here Equation 2 states that total output is proportional to government income. This method is useful as long as the share of total government income in total output,  $\pi_t$ , remained relatively constant throughout the century, or as long as its rate of growth could be simple to determine. It becomes very important that the measure of government income used in Equation 2, *I*, corresponds to government income that did not vary as a share of output. But it is particularly problematic that total government income should satisfy this requirement.<sup>21</sup>

The measure of total government income presents problems of double accounting due to transfers between local treasuries and to temporal transfers of income from year to year due to forced savings during the wars of Spain, which prevented boats from sailing. In addition, we should remove acquisition of debts from total government income. Managing all these components is no simple matter. The different components of total government income in the data presented by TePaske and Klein are very difficult to interpret.

TePaske has published a series on government income for the treasury of Mexico City, which represents an important effort to free that series of the problems mentioned above.<sup>22</sup> If we could get an estimate of the share of this revenue, which I will call fiscal income, it would be possible to rewrite Equation 2 to offer new estimates of economic growth for eighteenth-century Mexico. Recently, Klein has presented decade averages on government income for all 23 treasuries of New Spain.<sup>23</sup> He also tried to identify the problematic components of the series on government income. This data makes it possible to construct an index representing the share of fiscal income in Mexico City in total fiscal income in colonial Mexico. I use both series, in order to construct an index of total output for Colonial Mexico.

In summary, both Equations 1 and 2 have been used in the colonial economic historiography of Mexico to track the behaviour of New Spain's output during the eighteenth century. These equations have stimulated intense debate and important advances in both methods. The two most important relate to the need of a price series to deflate the nominal income estimates in Equations 1 and 2, and to the recognition that the use of

<sup>21</sup> The present essay allows government income to vary as a share of total output.

<sup>22</sup> TePaske, *Economic Cycles*.

<sup>23</sup> Klein, *American Finances*.



Equation 2 may lead to some bias since most available series on total government income may have varied as a share of total output.

The traditional picture of eighteenth-century Mexico, which the colonial historiography had been offering until two and a half decades ago, was one of economic growth. In their synthesis of the late colonial period, Enrique Florescano and Isabel Gil on the one hand,<sup>24</sup> and David Brading on the other,<sup>25</sup> along with Herbert S. Klein more recently,<sup>26</sup> characterised the second half of the eighteenth century as a period of rapid economic growth. Implicitly assuming Equations 1 and 2, much of their argument relied on the growth of total government income and silver production as measured by coined silver. They used series at current prices.

Until the early 1970s the use of nominal figures came from a general belief that New Spain's prices did not exhibit any trend during the entire eighteenth century. Florescano confirmed this belief in his study of the maize price for Mexico City during the 1709–1810 period.<sup>27</sup> Even though he found an increase in maize prices between 1780 and 1810, scholars did not grant it importance until new studies confirmed Florescano's findings for other cities and products for the same period.

The new studies discovered that from the 1770s until the end of the century the increase in maize prices in Mexico City was repeated in other regions.<sup>28</sup> More recently, García Acosta showed that the price of wheat in Mexico City rose from 1770 at least until 1814.<sup>29</sup> Crespo<sup>30</sup> found that the price of sugar increased between 1770 and 1810, after showing a downward trend for more than a century.

These price discoveries also had an important impact on the colonial economic historiography thanks to work by John Coatsworth.<sup>31</sup> He used

<sup>24</sup> Enrique Florescano and Isabel Gil Sánchez, 'La época de las reformas borbónicas y el crecimiento económico, 1750–1808,' in Alejandra Moreno Toscano et al., *Historia General de México*, vol. 2 (Mexico City, 1976), pp. 183–302.

<sup>25</sup> David Brading, *Miners and Merchants in Bourbon Mexico, 1763–1810* (Cambridge, 1971).

<sup>26</sup> Herbert S. Klein, 'La economía de la Nueva España, 1680–1809: un análisis a partir de las cajas reales,' *Historia Mexicana*, vol. 34, no. 4 (1985), pp. 561–609.

<sup>27</sup> Enrique Florescano, *Precios del maíz y crisis agrícolas en México, 1709–1810* (Mexico City, 1969).

<sup>28</sup> Richard L. Garner, 'Problèmes d'une ville minière mexicaine à la fin de l'époque coloniale: prix et salaires a Zacatecas (1760–1821),' *Cahiers des Amériques Latines*, 6 (1972), pp. 75–111; Flor de María Hurtado López, *Dolores Hidalgo, estudio económico, 1740–1790* (Mexico City, 1974); Cacia Rabell, 'San Luis de la Paz. Estudio de economía y demografía históricas, 1645–1810,' Tesis de Maestría, Mexico, 1975, and, *Los diezmos de San Luis de la Paz. Economía de una región del Bajío en el siglo XVIII* (Mexico City, 1986); and Silvia Galicia, *Precios y producción en San Miguel el Grande, 1661–1803* (Mexico City, 1975).

<sup>29</sup> Virginia García Acosta, *Los precios del trigo en la historia colonial de México* (Mexico City, 1988).

<sup>30</sup> Horacio Crespo, *Historia del azúcar en México* (Mexico City, 1990).

<sup>31</sup> John H. Coatsworth, 'The Limits of Colonial Absolutism: The State in Eighteenth Century Mexico,' in K. Spalding (comp.), *Essays in the Political, Economic and Social History of Colonial Latin America* (Newark, 1982), pp. 25–51; and, 'The Mexican Mining Industry in the

available price series to deflate the level of silver production in Equation 1, and suggested that government income in Equation 2 should also be deflated. The result was to characterise an economy that began to stagnate around 1780. As a result, the traditional picture of rapid economic growth in colonial Mexico that Enrique Florescano and Isabel Gil had envisaged was reduced to only 30 years of growth, from 1750 to 1780. The independence war (1810–1821) and its disastrous political and economic consequences may have suppressed economic development in Mexico, as the traditional historiography suggested, but the roots of slow growth and stagnation had their origin in the last quarter of the eighteenth century, before the wars.

This result led the economic history of colonial Mexico towards a complete revision of the traditional historiography as in the work of Jacobsen and Puhle,<sup>32</sup> Salvucci,<sup>33</sup> Liehr,<sup>34</sup> Coatsworth himself,<sup>35</sup> Pérez Herrero,<sup>36</sup> Van Young,<sup>37</sup> and Garner and Stefanou.<sup>38</sup> It was generally thought that the signals of growth in New Spain during the eighteenth century masked deeper structural problems that impeded the growth of productivity. These structural and institutional problems came into the open at the end of the colonial period.<sup>39</sup>

The revisionism of the 1980s generated two important questions. First, what caused the increase in prices at the end of the eighteenth century? Second, what caused the apparent economic stagnation of the late colonial period? Even though many competing hypotheses were proposed, few efforts were made to test them against the evidence. The most lasting attributed the possible stagnation of the Mexican economy to the lack of productivity growth. This, along with the evidence on population growth,

Eighteenth-Century Mexico,' in N. Jacobsen and H. Puhle (eds.), *The Economies of Mexico and Peru During the Late Colonial Period, 1760–1810* (Berlin, 1986), pp. 26–46; and his *Historiografía*.

<sup>32</sup> Jacobsen and Puhle (eds.), *The Economies of Mexico and Peru during the Late Colonial Period, 1760–1810*.

<sup>33</sup> Richard J. Salvucci, *Textiles and Capitalism in Mexico: An Economic History of the Obrajes, 1539–1840* (Princeton, 1987).

<sup>34</sup> Reinhard Liehr, *América Latina en la época de Simón Bolívar: la formación de las economías nacionales y los intereses económicos europeos 1800–1850* (Berlin, 1989).

<sup>35</sup> John H. Coatsworth, *Los orígenes del atraso: nueve ensayos de historia económica de México en los siglos XVIII y XIX* (Mexico City, 1990).

<sup>36</sup> Pedro Pérez Herrero, 'Los beneficiarios del reformismo borbónico: Metrópoli versus elites novohispanas,' *Historia Mexicana*, vol. 41, no. 2 (1991), pp. 207–64.

<sup>37</sup> Eric Van Young, *La crisis del orden colonial: estructura agraria y rebeliones populares de la Nueva España, 1750–1821* (Mexico City, 1992). <sup>38</sup> Garner and Stefanou, *Economic Growth*.

<sup>39</sup> Recent examples can be found in some of the articles in Coatsworth and Taylor (eds.), *Latin America and the World Economy since 1800*; and Stephen Haber (ed.), *How Latin America Fell Behind* (Stanford, 1997).

could explain the growth in prices in New Spain and economic stagnation after 1780.<sup>40</sup>

However, these new views were themselves revised in the 1990s. Available series on prices to deflate government income and the production of silver contain a lot of noise. Moving averages and regression equations are not resistant to peaks in the series, and conclusions may vary with the method used to smooth the series. Finally, signs of crisis after 1770 in the data could be interpreted as signals of turning points of growth.<sup>41</sup> In this paper I will confront the problem of smoothing a price series, and I will try to deal with its associated difficulties by using a moving median to smooth the series.<sup>42</sup>

### III. Economic growth estimates: methodology

Possible structural changes somewhere in the eighteenth century suggest that, in order to calculate an output index for New Spain, the best procedure would be to use some measure of government income. As has been noted, John TePaske and Herbert Klein assembled two volumes on income and expenditure for the Royal Government of New Spain,<sup>43</sup> but the raw data is very difficult to interpret, and the totals for government revenue contain debts and the double accounting problem already mentioned. Fortunately, TePaske<sup>44</sup> has published a series on fiscal income for the treasury of Mexico City that is free of these problems.

My point of departure in constructing an output index for eighteenth century Mexico is fiscal income for Mexico City, which I call  $R_t$ . Let us define  $\sigma_t$  as the share of fiscal income from the treasury of Mexico City in the total fiscal income of New Spain. Finally, let  $\tau_t$  be the share of total output in total fiscal income in New Spain. By definition, we know that nominal total output in New Spain,  $P_t \cdot Y_t$ , is given by:

$$P_t \cdot Y_t = \frac{R_t^s}{\sigma_t \cdot \tau_t} \quad (3)$$

<sup>40</sup> For more on this idea, see Richard J. Salvucci, 'Agriculture and the Colonial Heritage of Latin America: Evidence from Bourbon Mexico,' in Jeremy Adelman (ed.), *Colonial Legacies: The Problem of Persistence in Latin American History* (New York, 1999).

<sup>41</sup> See Carlos A. Ponzio, 'Interpretación económica del último período colonial mexicano,' *El Trimestre Económico*, vol. 65, no. 1 (1998), pp. 99–125.

<sup>42</sup> For an in-depth view of the changes occurred in the economic historiography of the 1990s, see the outstanding surveys in Noel Maurer, 'Progress Without Order: Mexican Economic History in the 1990s,' *Revista de Historia Económica*, Año XVII, no. Especial (1999), pp. 13–36; Antonio Ibarra, 'A modo de presentación: la historia económica mexicana de los noventa, una apreciación general,' *Historia Mexicana*, vol. 52 (2003), pp. 613–47; and Eric Van Young, 'La pareja desaparece: breves comentarios acerca de la relación entre historia económica y cultural,' *Historia Mexicana*, vol. 52 (2003), pp. 831–70. See also Thomas Skidmore, 'Studying the History of Latin America,' *Latin American Research Review*, vol. 33, no. 1 (1998), pp. 105–27.

<sup>43</sup> TePaske and Klein, *Ingresos y egresos*.

<sup>44</sup> TePaske, *Economic Cycles*.

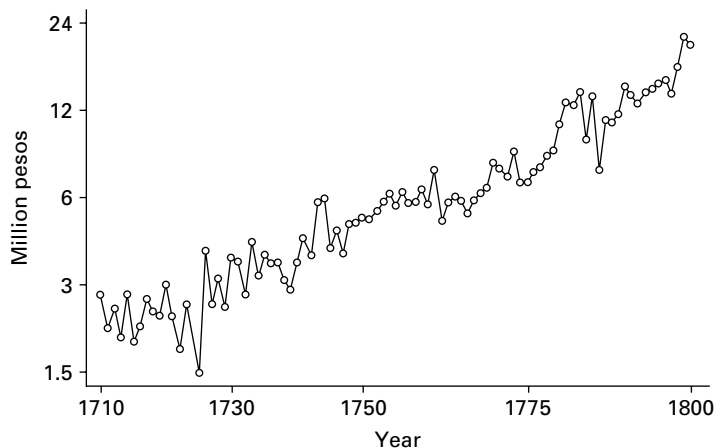


Fig. 1. *Fiscal income from the Treasury of Mexico City, 1710–1800*. Source: *TePake (1985)*.

where we have eliminated the fluctuations of fiscal income by smoothing the series on fiscal income with a five years moving median:

$$R_t^s = \text{median}(R_{t-2}, \dots, R_{t+2})$$

Figure 1 presents fiscal income for Mexico City, in logarithmic scale, according to TePaske. At the beginning of the 1710s, fiscal income was around 2.1 million pesos. During the 1730s, it rose to 3.5 million, and to 5 million pesos in 1750. By the beginning of the 1760s it was 5.8 million pesos, whereas at the beginning of 1780 it reached 10 million pesos. By the end of the century, fiscal income was around 18 million pesos.

In order to form an idea of the share of this fiscal income from Mexico City in total fiscal income for New Spain,  $\sigma_n$ , I use data published by Herbert S. Klein.<sup>45</sup> He presents decade averages on fiscal income for each of the 23 treasuries of New Spain. There is no complete information for each of the 23 treasuries throughout the entire eighteenth century, sometimes because not all of them were created at the same time.

From total income for each treasury, I subtract income borrowed from other treasuries, other transfers between treasuries, and miscellaneous income.<sup>46</sup> Then I calculate the growth, from decade to decade, of the resulting income for Mexico City as a share of total fiscal income in those treasuries that appear in two contiguous decades. More precisely, the decade growth rates are calculated as follows. Let us define the transposed

<sup>45</sup> Klein, *American Finances*.

<sup>46</sup> That is, from the values presented by Klein, *American Finances*, in his Table 5.1, I subtract the values given in his Tables 5.6 and 5.7.

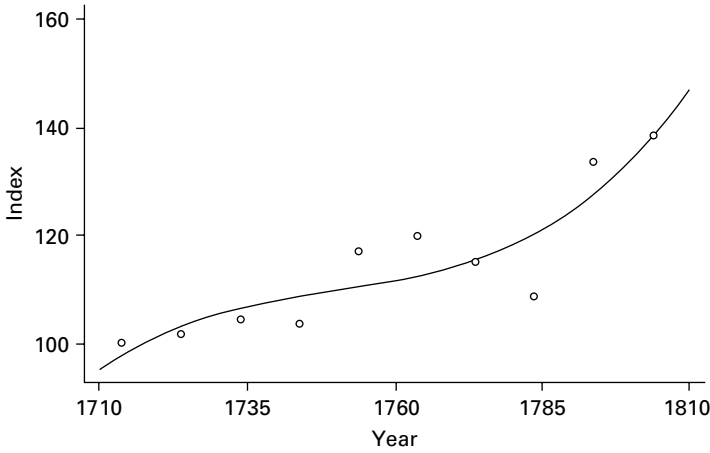


Fig. 2. *Share of fiscal income in Mexico City to New Spain's total.* Source: Index constructed from Klein (1998).

vector:  $a'_d = (a_{1d}, \dots, a_{23d})$ , where  $a_{id}$  is the average fiscal income for treasury  $i$  during the decade  $d$ , if available. If not available,  $a_{id}$  is zero. I also require the transposed vector  $n'_d = (n_{1d}, \dots, n_{23d})$ , where  $n_{id} = 1$  if both,  $a_{id}$  and  $a_{id-1}$  are different than zero.

The growth of the share of fiscal income from Mexico City =  $j$  is calculated:

$$\hat{\sigma}_{jd} = \frac{\left( \frac{a_{jd}}{a'_d \cdot n_d} \right) - \left( \frac{a_{jd-1}}{a'_{d-1} \cdot n_d} \right)}{\left( \frac{a_{jd-1}}{a'_{d-1} \cdot n_d} \right)}$$

The last values allow us to construct an index which I interpret as an estimate for the true value that  $\sigma_i$  takes in the fourth year of the corresponding decade. The resulting points are displayed in Figure 2. Finally, a polynomial regression of third degree is used to estimate  $\sigma_r$ . The fitted curve is also presented in Figure 2.

At this moment, we would be able to estimate the economic growth of eighteenth century New Spain at current prices, once we assume fiscal income in New Spain remained constant as a share of total output. In the 1710–1800 period total output grew at an annual compound rate of 2 per cent. When using a figure of 1 per cent for the annual rate of population growth, we find that nominal output in New Spain grew at an annual rate of 1 per cent. This result, however, exaggerates the economic growth of eighteenth-century Mexico since the available data suggest prices were higher at the end than at the beginning of the eighteenth century.

The literature offers a few series on prices for different regions in the eighteenth century. However, there is no price series that is homogeneous,

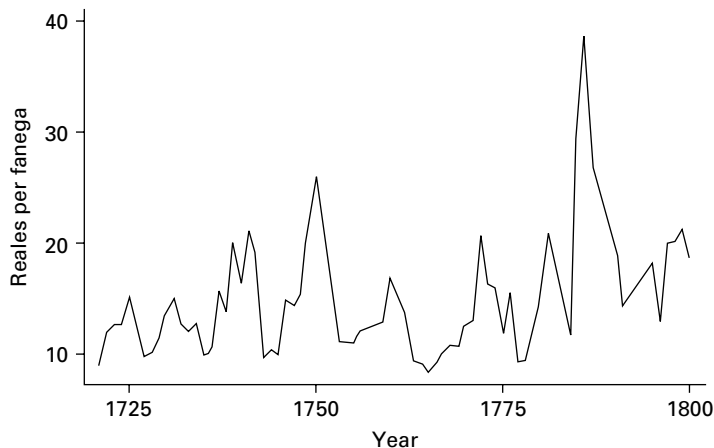


Fig. 3. *Maize Price in Mexico City, 1720–1800*. Source: Florescano (1969).

continuous and long enough to cover the 1710–1800 period does not exist. In spite of these limitations, Richard Garner has assembled several sources to construct an index for the maize price in New Spain,<sup>47</sup> and this is my point of departure for deflating the index of nominal output. Before we go direct to this price and with the purpose of comparison between different sources, let us review the two longest available series for the maize price in the centre of New Spain.

The first corresponds to the maize price presented by Enrique Florescano for Mexico City.<sup>48</sup> Figure 3 presents Florescano's annual averages for this price. Maximum prices reached in the 1720–1750 period grow. However, the minimum prices do not show any significant change during the same period. When using a moving median with a span of nine years the result suggests that the maize price was around 12 reales per fanega during the 1720s. In the 1730s the maize price begins to reach 15 reales by 1740, and it remains there until 1750. This price decreases to 10 reales per fanega across the 1760s. However, during the 1770s it grows to 12 or 13 reales, to 14 reales in 1790, and it reaches 20 reales around 1800.

The second series covers the maize price in the Valley of Mexico, according to Charles Gibson.<sup>49</sup> This series is presented in Figure 4. The trend of this maize price is downward during the 1700–1750/1760 period. From 16 reales in 1700, the price goes down to 14 reales per fanega in 1710, to 13 reales in 1720, to 12 reales in 1730, and it finally reaches 11 reales in 1750. From 1750 on, the downward trend stops, and the price remains

<sup>47</sup> Garner and Stefanou, *Economic Growth*.

<sup>48</sup> Florescano, *Precios del maíz*.

<sup>49</sup> Charles Gibson, *The Aztecs under Spanish Rule: A History of the Indians of the Valley of Mexico* (Stanford, 1964).

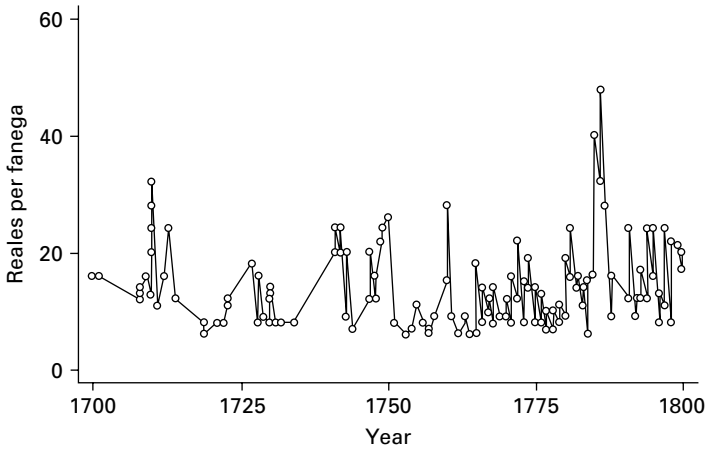


Fig. 4. *Maize Price in the Valley of Mexico, 1700–1800.* Source: Gibson (1967).

approximately constant until the decade of 1760. By the middle of this decade, the price jumps to 11.5 reales, and remains there until 1780, when the price of maize jumps again to reach 12.5 reales. It is around this number that the series fluctuates until 1800.

Figure 5 presents the maize price in New Spain as presented by Garner and Stefanou. This figure also provides the smoothed series corresponding to the moving median of span 9:

$$\hat{p}_t^s = \text{median}(p_{t-4}, \dots, p_{t+4})$$

where  $p_t$  refers to the observed price of maize as reported by Garner and Stefanou. During the 1720s the price of maize is around 8 reales per fanega. The price rises during the 1730s, and it reaches 11.5 reales in the 1740s, remaining there until 1750. The price falls to 7.5 reales during the 1760s. During 1770s the prices go up to 10.5 reales, and by 1790 reach 14 reales, ending the century in 15.5 reales per fanega. We should note that the price of maize presented by Garner and Stefanou in New Spain follows a very similar pattern to the maize price in Mexico City as presented by Florescano, but differs from the behaviour of the maize price in the valley of Mexico as presented by Gibson during the 1700–1750 period. Consequently, the results of this article should be treated with caution.

There are two reasons that make Garner's price index preferable. First, it is the only one that summarises information on the maize price for the entire New Spain, and not only for Mexico City or its valley. Secondly, it is the only one without missing values in any year for our period, so we can smooth the series with a moving median. In order to construct a price index to deflate the series on fiscal income, I assume that the price of all other non-tradable

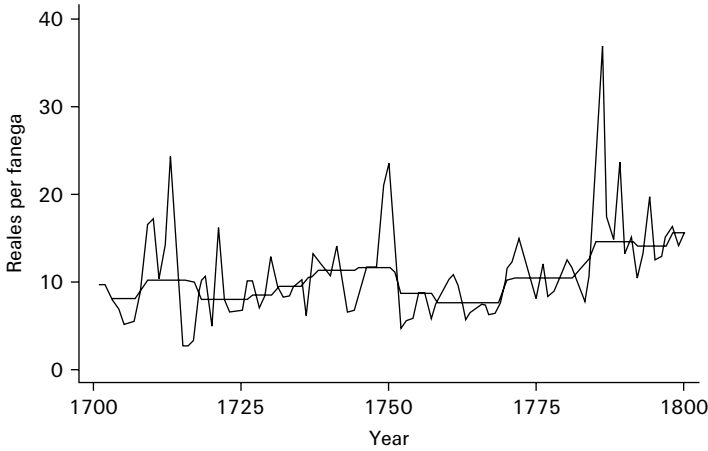


Fig. 5. *Maize price in New Spain, 1700–1800.* Source: *Garner and Stefanou (1993).*

goods different than maize,  $q$ , respond to the proportional changes in the maize price by a fraction  $\beta$ . Then, I calculate:

$$\hat{q}_t^s = \beta \cdot \hat{p}_t^s$$

as the proportional change in the price of other non-tradable goods different than maize. Finally, I construct the price index,  $P_t^s$ , from the equation:

$$\hat{P}_t^s = \alpha \cdot \hat{p}_t^s + (1 - \alpha) \cdot \hat{q}_t^s$$

and using the last two expressions we get:

$$\hat{P}_t^s = (\alpha + \beta - \alpha \cdot \beta) \cdot \hat{p}_t^s \quad (4)$$

The last equation states that a 100 per cent increase, or decrease, in the maize price leads the general price level to a  $(\alpha - \beta - \alpha \cdot \beta)$  per cent increase, or decrease. This paper presents results for a broad range of possible values for  $(\alpha - \beta - \alpha \cdot \beta)$ . However, note that the parameter  $\alpha$  represents the share of maize in non-tradable output, so that my own guess is that reasonable values for  $\alpha$  are between 0.25 and 0.50. On the other hand, reasonable values for  $\beta$  could be between 0.40 and 0.50. All this implies that  $(\alpha - \beta - \alpha \cdot \beta)$  could be between 0.55 and 0.75. However, the reader should note that this paper explores an even larger range for  $(\alpha - \beta - \alpha \cdot \beta)$ .

Finally, to estimate total output from fiscal income, we could assume that fiscal income in New Spain did not vary as a share of total output in New Spain through out the entire eighteenth century. So  $\tau_t$  could be assumed to be constant. However, we know that the colonial government associated its income with the production of silver. Therefore, there is the possibility that the share of fiscal income in total output could be related to the share of



silver in total output. This paper tries to capture such a possibility by assuming the following relationship between the share of fiscal income and the share of silver in total output ( $\hat{x}$ ):

$$\hat{\tau}_t = \gamma \cdot \hat{x}_t$$

On the other hand, there is the possibility that during the periods of economic growth there was a transfer of resources from non-taxable to taxable sectors, that is, from rural to urban regions. Even more, the non-taxable sector may have had displayed a different behaviour than the taxable sector. We also try to capture such possibilities by assuming the following relationship between the share of fiscal income and economic growth:

$$\hat{\tau}_t = \delta \cdot \hat{y}_t$$

where  $y_t$  is per capita output. For  $\gamma$  positive, this equation establishes that the share of fiscal income in total output grows if, and only if, there is per capita growth. To combine the last two ideas in one expression, each of them being a particular case of the more general form, we construct the linear combination:

$$\hat{\tau}_t = \lambda \cdot \gamma \cdot \hat{x}_t + (1 - \lambda) \cdot \delta \cdot \hat{y}_t \tag{5}$$

where  $\lambda$  can take the values zero and one.

Intermediate cases in which  $0 < \lambda < 1$  are relatively difficult to study. These cases would correspond to assuming that the share of fiscal income in total output varies with both, the share of silver in total output, and with per capita output. This article is limited to showing that the estimated rate of per capita growth in the more general case is determined by a linear combination of the estimated rates of growth when  $\lambda$  equals zero and one. Let  $\hat{y}(\lambda_i)$  be the estimated rate of per capita growth when  $\lambda$  equals  $\lambda_i$ . Then, the general formula for estimating per capita growth under arbitrary values of  $\lambda$  in Equation 5 would be:

$$\hat{y}(\lambda_i) = \frac{\lambda(1 - \gamma)}{(1 - \bar{\gamma} + \bar{\delta})} \cdot \hat{y}(1) + \frac{(1 - \lambda)(1 + \delta)}{(1 - \bar{\gamma} + \bar{\delta})} \cdot \hat{y}(0)$$

where  $\bar{\delta} = \lambda \cdot \delta$  and  $\bar{\gamma} = (1 - \lambda) \cdot \gamma$ .

Finally, let us consider the relationship between the rate of growth when the share of fiscal income is assumed to be constant and the rate of growth when we assume the share of fiscal income varies with either, the share of silver in total output, or with per capita income. Let us denote by  $\hat{y}_{j/k}$  the rate of per capita growth in the period from year  $j$  to year  $k$ , when assuming the share of fiscal income in total output remained constant.<sup>50</sup>

<sup>50</sup> The corresponding values for this variable are presented in Tables 4 and 5 below.

We begin by calculating economic growth by assuming that the share of fiscal income in total output varies with the share of mining output in total output. Therefore,  $\lambda = 1$  in Equation 5. The estimated rate of per capita growth,  $\hat{y}_{jk}(1)$ , is given by the following Equation 6:

$$\hat{y}_{jk}(1) = \frac{\hat{y}_{jk}}{1 - \gamma} - \frac{\gamma \cdot \hat{x}_{jk}}{1 - \gamma}$$

where  $\hat{x}_{jk}$  represents the growth rate in per capita output of silver.

Now we calculate the rate of growth when the share of fiscal income in total output varies with per capita output. This is the case of  $\lambda = 0$  in Equation 5. Let us once again denote by  $\hat{y}_{jk}$  the rate of growth when the share of fiscal income in total output is assumed to be constant during the century. And let  $\hat{y}_{jk}(0)$  be the estimated rate of per capita growth when the share of fiscal income in total output varies with per capita output. Then,

$$\hat{y}_{jk}(0) = \frac{\hat{y}_{jk}}{1 - \delta} \quad (7)$$

#### *IV. Economic growth estimates: results*

First, I wish to establish that there was positive per capita growth in eighteenth-century Mexico. Finding support for per capita growth in this period is remarkable in that the seventeenth and the first part of the nineteenth were periods of economic stagnation, and of disintegration from world markets for Mexican exports. The next question in this paper is whether such per capita growth was pushed by the dominant export product of the epoch: silver. The answer is positive. The third and final question is whether economic growth improved during the period of Bourbon reforms. The answer here is more ambiguous. Economic growth may have improved, but not as expected. Mining ceased to be the source of economic growth at the end of the century.

The per capita growth estimates for the 1710–1798 period are presented in Tables 1 and 2. Table 1 presents the average annual rates of growth for per capita output under different assumptions about  $(\alpha - \beta - \alpha \cdot \beta)$  and  $\delta$ , assuming the share of government income varied with silver production ( $\lambda = 1$  in equation 5). Table 2 provides the average annual rate of growth for per capita output under different assumptions about  $(\alpha - \beta - \alpha \cdot \beta)$  and  $\gamma$ , assuming government income varies with per capita output ( $\lambda = 0$  in Equation 5). In presenting the results in Tables 1 and 2, I follow the literature in assuming that population grew at an annual rate of 1 per cent.

The first row in Tables 1 and 2 provides exactly the same information. This is the annual compound rate of per capita growth under the assumption that the share of fiscal income in total output was constant throughout the

Table 1. *Annual Rates of Estimated Per Capita Growth for Colonial Mexico, 1710–1798.  $\lambda = 1$ . Different Assumptions on  $\alpha$ ,  $\beta$  and  $\gamma$* 

	$\alpha - \beta - \alpha \cdot \beta$									
$\gamma$	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	0.95
0.0	0.98	0.91	0.85	0.80	0.75	0.70	0.66	0.61	0.57	0.53
0.1	1.02	0.94	0.88	0.82	0.77	0.71	0.66	0.61	0.57	0.52
0.2	1.08	0.99	0.91	0.85	0.79	0.73	0.66	0.61	0.56	0.51
0.3	1.14	1.04	0.96	0.89	0.81	0.74	0.67	0.61	0.56	0.50
0.4	1.23	1.12	1.02	0.93	0.85	0.77	0.68	0.62	0.55	0.48
0.5	1.36	1.22	1.10	1.00	0.90	0.80	0.70	0.62	0.54	0.46
0.6	1.55	1.38	1.23	1.10	0.98	0.85	0.73	0.63	0.53	0.43
0.7	1.87	1.63	1.43	1.27	1.10	0.93	0.77	0.63	0.50	0.37
0.8	2.50	2.15	1.85	1.60	1.35	1.10	0.85	0.65	0.45	0.25
0.9	4.40	3.70	3.10	2.60	2.10	1.60	1.10	0.70	0.30	-0.10

Source: See text.

Table 2. *Annual Rates of Economic Growth Estimated for Colonial Mexico, 1710–1798.  $\lambda = 0$ . Different Assumptions on  $\alpha$ ,  $\beta$  and  $\delta$* 

	$\alpha - \beta - \alpha \cdot \beta$									
$\delta$	0.05	0.15	0.25	0.35	0.45	0.55	0.65	0.75	0.85	0.95
0.0	0.98	0.91	0.85	0.80	0.75	0.70	0.66	0.61	0.57	0.53
0.1	0.89	0.83	0.77	0.73	0.68	0.64	0.59	0.55	0.52	0.48
0.2	0.82	0.76	0.71	0.67	0.63	0.58	0.54	0.51	0.48	0.44
0.3	0.75	0.70	0.65	0.62	0.58	0.54	0.50	0.47	0.44	0.41
0.4	0.70	0.65	0.61	0.57	0.54	0.50	0.46	0.44	0.41	0.38
0.5	0.65	0.61	0.57	0.53	0.50	0.47	0.43	0.41	0.36	0.35
0.6	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.38	0.36	0.33
0.7	0.58	0.54	0.50	0.47	0.44	0.41	0.38	0.36	0.34	0.31
0.8	0.54	0.51	0.47	0.44	0.42	0.39	0.36	0.34	0.32	0.29
0.9	0.52	0.48	0.45	0.42	0.39	0.37	0.34	0.32	0.30	0.28
1.0	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27

Source: See text. Annual population rate of growth assumed to be 1 per cent.

century. Assuming that  $(\alpha - \beta - \alpha \cdot \beta)$  equals 0.65, these rows show that the annual rate of growth for per capita output equals 0.66 per cent in the 1710–1798 period. My own guess is that the parameter  $\alpha$  is between 0.25 and 0.50, whereas plausible values for  $\beta$  are between 0.40 and 0.50. This implies that the elasticity of the price level with respect to the price of non-tradable goods,  $(\alpha - \beta - \alpha \cdot \beta)$ , would be between 0.55 and 0.75. Under the assumption of a constant share of government income, values for  $(\alpha - \beta - \alpha \cdot \beta)$  between 0.75 and 0.55 lead to estimates of annual per capita growth between 0.61 and 0.70 per cent. Furthermore, a value for  $(\alpha - \beta - \alpha \cdot \beta)$  as high as 0.95 implies an annual average rate of per capita growth equal to 0.53 per cent.

Now, Table 1 presents the estimates on economic growth assuming that any change in the share of fiscal income in total output was due to changes in the share of silver production in total output. That is, when  $\lambda = 1$  in Equation 5. The first notable result is that, with a single exception, all numbers in Table 1 are positive: there was positive per capita growth in eighteenth-century Mexico.

When  $(\alpha - \beta - \alpha \cdot \beta)$  takes values smaller than 0.75, the estimates on economic growth are higher the larger the value for  $\gamma$ . That is, the higher the response of the share of fiscal income as a share of total output to changes in the share of silver production in total output, then the higher is the estimated growth for eighteenth century Mexico, as long as  $(\alpha - \beta - \alpha \cdot \beta) \leq 0.75$ . If we consider values higher than 0.85 for  $(\alpha - \beta - \alpha \cdot \beta)$ , then the estimated rate of economic growth declines when  $\gamma$  rises. The higher the response of the share of fiscal income to changes in the share of silver, the less the estimated growth for eighteenth-century Mexico.

In Table 1, the estimated economic growth rises when the value for  $(\alpha - \beta - \alpha \cdot \beta)$  reduces. That is, the lower the change in prices we assume, the higher the estimated rate of growth. This relationship is valid for any value of  $\gamma$  in Table 1. The effect of  $\gamma$  on the estimates is that as we increase its value, the range of possible estimates for economic growth for different values of  $(\alpha - \beta - \alpha \cdot \beta)$  also rises. For instance, possible rates of per capita growth when  $\gamma = 0$  are between 0.53 and 0.98 per cent. On the other hand, possible values of economic growth when  $\gamma = 0.8$  are between 0.25 and 2.50 per cent.

Table 2 provides the results for economic growth when the share of fiscal income in total output only varies with per capita output ( $\lambda = 0$  in Equation 5). That is, we assume the share of silver production in total output does not affect the share of fiscal income in total output. Again I assume an annual population growth rate equal to 1 per cent. All numbers in Table 2 are positive, showing that per capita growth was positive in the 1710–1798 period.

Table 2 also shows that the estimated rate of per capita growth reduces when  $\delta$ , the response of fiscal income to per capita output, rises. For instance, the range of possible rates of per capita growth, when  $\delta = 0$ , is between 0.53 and 0.98 as  $(\alpha - \beta - \alpha \cdot \beta)$  varies between 0.95 and 0.05. On the other hand, the range of possible rates of per capita growth, when  $\delta = 1$ , is between 0.27 and 0.49 as  $(\alpha - \beta - \alpha \cdot \beta)$  varies between 0.95 and 0.05. And as in Table 1, the estimated rate of per capita growth also falls when the response of our price index to changes in the maize price,  $(\alpha - \beta - \alpha \cdot \beta)$ , rises.

Intermediate cases in which  $0 < \lambda < 1$  are relatively difficult to study. They correspond to assuming the share of fiscal income in total output varies with both the share of silver in total output and with per capita output. As shown in the last section, the estimated rate of per capita growth in the more general

Table 3. *Annual Rates of Per Capita Growth in European Countries. Sixteenth to Eighteenth Centuries*

Country	1500–1600	1600–1700	1700–1820
Austria	0.17	0.17	0.17
Belgium	0.11	0.16	0.12
Denmark	0.17	0.17	0.17
Finland	0.17	0.17	0.18
France	0.14	0.16	0.18
Germany	0.14	0.14	0.12
Italy	0.00	0.00	0.01
Holland	0.60	0.43	-0.12
Norway	0.17	0.17	0.17
Sweden	0.17	0.17	0.17
Switzerland	0.17	0.17	0.17
United Kingdom	0.31	0.25	0.26
Portugal	0.20	0.10	0.10
Spain	0.25	0.00	0.14

*Source:* Angus Maddison, *The World Economy: A Millennial Perspective* (Paris, 2001).

case is determined by a linear combination of the estimated rates of growth in Tables 1 and 2.

The results in Tables 1 and 2 are surprising when compared to the notion in the economic historiography that both the seventeenth century and the first part of the nineteenth century were periods in which exports and the Mexican economy as a whole stagnated. The results are also surprising when compared to the rates of growth observed in European countries between the sixteenth and eighteenth centuries. Among the European countries shown in Table 3, only the Netherlands had rates of growth as high as 0.60 per cent during the sixteenth century, and 0.43 per cent during the seventeenth century. The United Kingdom achieved annual average rates of growth in per capita output between 0.25 and 0.31 per cent in the sixteenth to eighteenth century period. Spain recorded one of highest sixteenth-century growth rates, an annual rate of per capita growth of 0.25 per cent. For sixteenth-century Portugal the rate of growth in per capita output was 0.20 per cent. The other 35 entries show annual rates of per capita growth less than 0.20 per cent.

Eighteenth-century Mexico seems to have achieved very high growth rates, even when compared to the 0.5 per cent rate of growth currently calculated for the eighteenth century in colonial British America.<sup>51</sup> That high rate of growth is usually explained as the result of the use and transformation

<sup>51</sup> See Jeremy Atack and Peter Passell, *A New Economic View of American History: From Colonial Times to 1940* (New York, 1994).

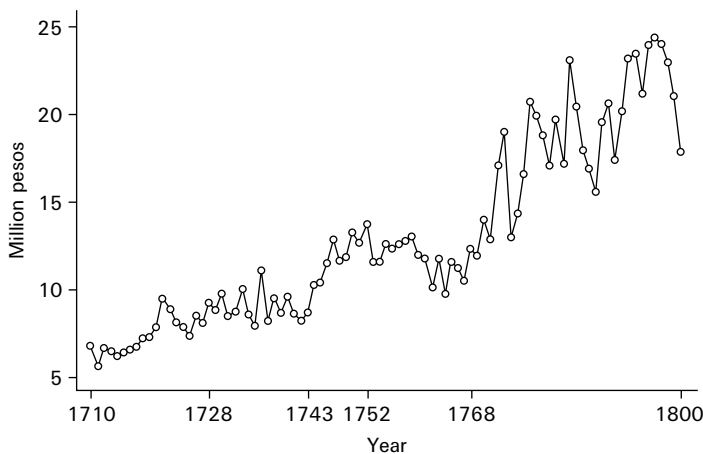


Fig. 6. *Annual Coined Silver, 1710–1800*. Source: *Orozco* (1857).

of available European technologies among its free and egalitarian citizens.<sup>52</sup> Clearly, these elements were not present in New Spain.

The economic historiography suggests that part of the Mexican growth in the eighteenth century may have been pushed by the growth in the dominant export product: silver. We know that the growth of silver production could have allowed the economic organisation and employment of resources. And therefore, it is important to distinguish the periods of mining expansion from those of mining stagnation.

Figure 6 presents annual silver production in New Spain, as measured by coined silver in the minting houses of New Spain. The source of this data is Orozco,<sup>53</sup> and for our purposes, the results are the same when using the alternative series on coined silver by Humboldt.<sup>54</sup> In Figure 6 I have selected different years to separate the periods of mining booms from those periods of mining stagnation. The 1710–1728 period is one of growth in coined silver. Some 6.7 million pesos were coined in 1710, rising to more than 9 million pesos in 1728. Between that year and 1743, silver production stagnated, and in 1743, approximately 8.6 million pesos were coined. From 1744 to 1752, silver production recovered, and in 1752 the amount of silver coined reached 13.7 million pesos.

We can, then, distinguish three periods: one is of mining expansion (1710–1728), a second of mining stagnation (1743–1752), and a third in which there is another boom in silver production (1743–1752). During the

<sup>52</sup> Engerman and Sokoloff, *Factor Endowments*.

<sup>53</sup> Manuel Orozco y Berra, 'Informe sobre la acuñación en las Casas de Moneda de la República,' *Anexo a la memoria de la Secretaría de Fomento* (Mexico City, 1857).

<sup>54</sup> Alexander von Humboldt, *Ensayo político sobre el reino de la Nueva España* (Mexico City, 1966).

Table 4. *Annual Rates of Per Capita Growth in New Spain, different periods.*  
*Assuming  $\delta = \gamma = 0$*

$\alpha + \beta - \alpha \cdot \beta$	1710-29	1729-44	1744-53	1753-69	1769-98
0.05	0.61	1.24	1.30	-0.29	1.66
0.15	0.70	1.02	1.61	-0.21	1.39
0.25	0.79	0.80	1.92	-0.13	1.12
0.35	0.88	0.58	2.24	-0.15	0.91
0.45	0.98	0.37	2.56	-0.16	0.70
0.55	1.08	0.16	2.90	-0.06	0.45
0.65	1.18	-0.05	3.23	-0.06	0.24
0.75	1.29	-0.26	3.58	-0.14	0.12
0.85	1.40	-0.46	3.93	-0.12	-0.08
0.95	1.51	-0.67	4.30	-0.02	-0.32

*Source:* See text. The annual rate of population growth is assumed to be 1 per cent.

second half of the century, we can identify two distinct periods. The first, from 1752 to 1769, is of mining stagnation, during which pesos coined in fell from 13.7 million to 11.9 million. During the 1770s, however, silver production recovered to reach 18 million pesos. A second increase in silver production occurred during the 1790s, to reach 20 million pesos by the end of the century.

Table 4 presents the results for per capita economic growth for different values of  $(\alpha - \beta - \alpha \cdot \beta)$ . The estimated values were calculated after smoothing the output index with a five years moving median. Table 5 presents the results for a narrower range of  $(\alpha - \beta - \alpha \cdot \beta)$ , between 0.56 and 0.74. Table 5 also uses smoothed values with a five years moving median.

Table 4 shows that values of  $(\alpha - \beta - \alpha \cdot \beta)$  less than 0.55 imply a very negative per capita growth rate in the 1753-1769 period. Similarly, for values of  $(\alpha - \beta - \alpha \cdot \beta)$  larger than 0.75, the estimated rate of per capita growth in the 1729-1744 period is very low. Values for  $(\alpha - \beta - \alpha \cdot \beta)$  between 0.55 and 0.66 result in estimates that seem reasonable. If we restrict ourselves to values of  $(\alpha - \beta - \alpha \cdot \beta)$  between 0.55 and 0.66, we may also conclude that the economic growth of eighteenth-century Mexico coincides with the periods of growth in silver production.

Table 5 presents the results on economic growth when the possible values for  $(\alpha - \beta - \alpha \cdot \beta)$  are between 0.56 and 0.74. As in Table 4, in Table 5 I assume the share of fiscal income in total output remained constant through out the century. Table 5 shows that during the first half of the century, the periods of mining expansion coincide with the periods of high growth in total output. This result strongly supports the idea that there was a connection between the economic growth of New Spain and the growth of silver production.

During the periods of mining expansion in the first half of the century, 1710-1728 and 1743-1752, the calculated growth rates for per capita output

Table 5. *Annual Rates of Per Capita Growth in New Spain, different periods.**Assuming  $\delta = \gamma = 0$* 

$\alpha + \beta - \alpha \cdot \beta$	1710-29	1729-44	1744-53	1753-69	1769-98
0.56	1.08	0.14	2.93	-0.05	0.42
0.58	1.11	0.09	3.00	-0.03	0.37
0.60	1.13	0.06	3.06	-0.01	0.32
0.62	1.15	0.01	3.13	-0.03	0.29
0.64	1.17	-0.03	3.20	-0.05	0.26
0.66	1.19	-0.07	3.27	-0.07	0.23
0.68	1.21	-0.11	3.34	-0.08	0.20
0.70	1.23	-0.16	3.41	-0.10	0.18
0.72	1.25	-0.20	3.48	-0.12	0.15
0.74	1.28	-0.24	3.55	-0.13	0.13

*Source:* See text. Smoothed values. Population growth assumed equal to 1 per cent per year.

are between 1.08 and 3.55 per cent. But during the period of mining stagnation, say between the years of 1728 and 1743, the annual rate of growth for per capita output was calculated at 0.0 per cent. These results extend to the second half of the century, the period of positive per capita growth coinciding with the period of boom in silver production that occurred under the Bourbon reforms.

The effect of the reforms was to reanimate economic growth in New Spain, albeit to a lesser extent in comparison to the growth observed during the first half of the century. As shown in Table 5, I calculate an annual rate of per capita growth between 0.13 and 0.42 per cent for the 1769-1798 period. This rate is low when compared to the calculated per capita growth rates of the first half of the century, when the rates of growth are between 1.08 and 3.55 per cent.

This suggests that growth based on the export of silver exhausted by the end of the colonial period. To make the calculations more precise, let us take a value of 0.65 for  $(\alpha - \beta - \alpha \cdot \beta)$ . In this case, the periods of mining expansion in the first half of the century, 1710-1729 and 1744-1753, saw annual rates of per capita growth of 1.18 and 3.23 per cent respectively. On the other hand, in the period of Bourbon reforms and mining recovery, 1769-1798, per capita growth is calculated in 0.24 per cent per year.

I find that during the entire eighteenth century the periods of mining growth coincide with the periods of high growth in total output. As before, I present more precise figures by using a value for  $(\alpha - \beta - \alpha \cdot \beta)$  equal to 0.64. In the periods of mining expansion during the first half of the century, 1710-1729 and 1744-1753, the rates of per capita growth are equal to 1.17 and 3.20 per cent per year, respectively. But during the period of mining stagnation, from 1729 to 1744, the annual rate of per capita growth is 0.0 per cent. I continue to assume that population growth was 1 per cent, and that



the share of fiscal income in per capita output was constant through out the century. I conclude all per capita growth in the first half of the century occurred during the periods of growth in mining.

The same result applies to the second half of the eighteenth century. In fact, there is no change in the relationship between silver production and total output. Again, I present precise figures by using a value for  $(\alpha - \beta - \alpha \cdot \beta)$  equal to 0.64. Between 1752 and 1768 mining output stagnates, and so does per capita output. In the period of Bourbon reforms, say between 1769 and 1798, silver production recovers and the rate of growth of per capita output does increase. In fact, the growth rate in per capita output went from 0.0 per cent in the 1753–1769 period, to 0.24 per cent in the 1769–1798 period. These results are summarised in Table 5.

This change in the rate of growth that occurs after 1769 seems to have no important consequences for the period under study. Between 1753 and 1769 the rate of per capita growth was around zero per cent per year. Per capita output, behaving like this for the rest of the century, would have remained constant to 1800. However, I calculate that per capita output grew 8.4 per cent during the last 31 years of the eighteenth century. That is the effect Bourbon reforms could have had on the economic growth of the late colonial period in Mexico.

This result, that during the period of Bourbon reforms there was some improvement in economic growth, is in contrast to that reached by the critics of the 1980s. However, it confirms the conviction of those critiques that economic growth in the late colonial period was not as dazzling as the traditional historiography had suggested. This finding derives from a comparison of the annual rate of per capita growth in the period of mining expansion of 1710–1729 period, which equals 1.17 per cent, with the annual rate of per capita growth of 0.26 per cent for the 1769–1798 period.

These estimates do not support the idea that the roots of sustained economic growth in Mexico could be situated in the eighteenth century. Per capita growth during the periods of mining stagnation, which I calculated in around 0.0 per cent per year, is much lower than the estimated rate of growth in periods of mining expansion. The reader should also recall that during the periods characterised by the lack of growth in mining output, the estimated rate of per capita growth in Mexico did not show very similar results to the growth observed in European countries during the sixteenth to eighteenth centuries (see Table 3). Finally, each period of mining stagnation is yet to be followed by another period of growth led by the mining sector.

I now summarise the conclusions we have reached on the economic growth of eighteenth century New Spain, assuming throughout that the share of fiscal income in total output remained constant throughout the century. First, this is a period of rapid economic growth for Mexico. Second,

Table 6. *Annual Rates of Per Capita Growth in Mining and Output, New Spain, different periods. Assuming  $(\alpha + \beta - \alpha \cdot \beta) = 0.65$  and  $\lambda = 1$* 

Period	Mining	Per capita output				
		$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$
1710–1729	1.41	1.18	1.15	1.12	1.08	1.03
1729–1744	–2.21	–0.05	0.19	0.49	0.88	1.39
1744–1753	3.31	3.23	3.22	3.21	3.20	3.18
1753–1769	–1.34	–0.06	0.08	0.26	0.49	0.79
1769–1798	1.42	0.24	0.11	–0.05	–0.27	–0.55
1710–1798	0.60	0.66	0.66	0.66	0.67	0.68

*Source:* See text.

we can observe sub-periods of high economic growth, which coincide with the sub-periods of mining expansion. The periods of economic stagnation in terms of per capita output also coincide with the stagnation of mining output. Therefore, we concluded that the origins of sustained economic growth for Mexico could not be situated in the eighteenth century. Finally, I found economic growth slightly improved during the period of Bourbon reforms, in comparison to its previous period of mining stagnation. However, even though economic growth improved during the last 30 years of the eighteenth century, this growth did not achieve the splendour of the first half of the century. Mining output ceased to be the source of economic growth at the end of the eighteenth century.

Can we extend these results to more general cases in which we do not assume the share of fiscal income in total output remained constant throughout the eighteenth century? For extreme values of the parameters, the answer is negative.

Equation 6 allows calculating economic growth when we assume that the share of fiscal income in total output varies with the share of mining in total output. This is the case of  $\lambda = 1$  in Equation 5. Table 6 presents the per capita growth rates in this case. The values for per capita growth in silver production, during our periods of interest, are shown in the first column of Table 6. The remaining columns display the results on economic growth using Equation 6. Table 6 presents results while assuming  $(\alpha - \beta - \alpha \cdot \beta)$  equals 0.65. The second column in Table 6 provides the estimates when  $\delta = 0$ . That column presents the same information than the seventh row in Table 4. The first two columns are used in Equation 6 to obtain the results of the remaining columns.

When the sensibility of fiscal income to changes in silver production,  $\delta$ , increases, our results on economic growth also change. The periods of mining expansion see a decline in the estimated rate of economic growth,

while the periods of mining stagnation see a rise in the estimated rate of growth. For large values of  $\delta$ , say larger than 0.4, the conclusions we previously obtained begin to disappear. For values of  $\delta$  lesser than 0.3, the conclusions remain. That is, the periods of mining expansion are the ones that see higher rates of growth in per capita output.

In Table 6, when assuming that the share of fiscal income in total output remains constant, per capita silver production and per capita output grew at roughly the same rate during the first half of the century, but only in periods of mining expansion; during the period of mining stagnation in 1744–1753 total output grew more rapidly than silver. Therefore, Equation 1 seems to be a good approximation during the periods of mining growth in the first half of the eighteenth century when  $Y$  refers to real, not nominal, output.

Following the same Table 6, we should note that in the second half of the century Equation 1 fails to be a good approximation to describe the behaviour of real output. For the second half of the century Equation 1 provides a better approximation for the behaviour of nominal output, especially during the period of mining growth. For the 1769–1798 period the annual rate of growth for mining output was 2.42 per cent per year, while nominal output grew at a rate of 2.83 per cent per year. There is, then, a good fit for the behaviour of nominal output during the last 30 years of the eighteenth century.

Finally, I note that in Table 6, two of our previous conclusions disappear. First, for values of  $\gamma$  larger or equal than 0.1, it seems that by the middle of the century, New Spain grows in a period of mining stagnation. This is important because it seems to establish its own growth dynamics, confirming the Florescano and Gil view of growth after 1750.<sup>55</sup> And secondly, I can also find a decline in the growth rate of the last 30 years of the eighteenth century, during the period of Bourbon reforms, when  $\gamma$  is larger or equal than 0.2. This would confirm the critiques of the 1980s and early 1990s.

Now I consider how the results are modified when we allow the share of fiscal income in total output to vary with per capita output. This is the case of  $\lambda = 0$  in Equation 5. In this case, the orders of magnitude in rates of growth among different periods do not change. The conclusions are the same as in the case where we assumed that the share of fiscal income in total output remained constant through out the century. That is, positive per capita growth occurs only during the periods of mining expansion, and the period of Bourbon reforms saw some improvement in the rate of growth. Table 7 presents the results for different values of  $\gamma$ , when we assume  $(\alpha - \beta - \alpha \cdot \beta)$  equals 0.65.

<sup>55</sup> Florescano and Gil, *La época de las reformas*.

Table 7. *Annual Rates of Per Capita Output Growth, New Spain, different periods. Assuming  $(\alpha + \beta - \alpha \cdot \beta) = 0.65$  and  $\lambda = 0$* 

Period	$\delta = 0$	$\delta = 0.1$	$\delta = 0.2$	$\delta = 0.3$	$\delta = 0.4$	$\delta = 0.5$
1710–1729	1.18	1.07	0.98	0.91	0.84	0.79
1729–1744	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03
1744–1753	3.23	2.94	2.69	2.48	2.31	2.15
1753–1769	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04
1769–1798	0.24	0.22	0.20	0.18	0.17	0.16
1710–1798	0.66	0.59	0.54	0.50	0.46	0.43

The calculations presented in this article allow us to construct an index of the share of silver production in total nominal output for New Spain in order to understand the implication of our estimates on that ratio. In this paper we only consider one example, based on assuming the share of fiscal income in total output remained constant in the eighteenth century, that is, assuming  $\delta = \gamma = 0$ . Let us consider the case of  $(\alpha - \beta - \alpha \cdot \beta)$  equal to 0.65. Following some of the colonial historiography, let us assume that 8 per cent is the share of silver in total nominal output at the end of the eighteenth century, in particular in 1798.

At the beginning of our period of study, mining represented 11.4 per cent of total output. During the period of mining expansion that starts in 1710, the share of mining grows to 13.0 per cent in 1729. The next period saw a decline in this share, to 10.8 per cent in 1744. Towards 1753, once there was some economic growth, the share of mining remains at 10.9 per cent. From 1753 the share of silver declines to 9.5 per cent in 1769, falling to 8 per cent in 1798.

Once we determine the share of mining in nominal output,  $\theta$ , we can use the corresponding index for real per capita output to construct an index of non-mining output,  $A$ , from the equation:

$$A = (1 - \theta) \cdot y$$

In the example we are considering in this paper, the behaviour shown by the index of non-mining output is very similar to the behaviour of total output. The rates of per capita growth during the periods of mining expansion are 1.1 (1710–29), 3.2 (1744–53) and 0.3 (1769–98) per cent per year. The rates of per capita growth during the periods of mining stagnation are 0.12 (1729–44) and 0.03 (1753) per cent per year. The reader should note that even though some of the magnitudes are altered as in comparison to our index of per capita output, the relationship between economic growth and mining growth also seems to apply to non-mining output.

*V. Final comments*

As has long been recognised in the social sciences, the Mexican experience of development cannot be treated separately from the pattern of transactions that the country has established with the world system. What is astonishing is that during the last one hundred years of the colonial period Mexico experienced advantageous dealings with the rest of the world. This is the most surprising result in the present essay, since it turns on its head the traditional interpretation of the colonial era.<sup>56</sup>

The estimated rate of Mexican per capita growth is very similar to the currently estimated rate for the colonial United States in the same century. This result is in stark contrast to the economic stagnation found by other authors in the seventeenth and the first part of the nineteenth century. Both are periods of disintegration from international markets for Mexican exports.

Possible sources of error resulting from my assumptions and the nature of the data have been noted throughout the article, the results of which should be treated with caution. In particular, an exhaustive study of government income, prices and population growth, could yield improved results for the economic growth estimates for eighteenth-century Mexico.

My qualitative results on the relationship between mining expansion and economic growth during the first half of the century are very robust. Less robust are the conclusions for the second half of the century. Without doubt, the magnitudes involved in this relationship may be sensible to the definition of periods and my assumptions, but the qualitative relationship between mining expansion and total output growth is definitely present during the first half of eighteenth century New Spain. For the second half, my analysis depicts the same relationship, but synthesises both the old and the new paradigms: Bourbon reforms improved economic growth, but not sumptuously.

The comparisons of per capita growth between Mexico and European countries are sensitive to the assumption of 1 per cent per year for population growth. Of course, if population growth was higher than 1 per cent during the second half of the eighteenth century, Mexico would have experienced a decline in per capita output by the end of the colonial period.

Nonetheless, it has been our argument that the eighteenth century was important for New Spain. Colonial Mexico grew. In 1800 its per capita output was between 1.6 and 1.9 times higher than in 1700. And behind this growth lay the mercantilist policies of Spain. Without doubt, during this period the economy benefited from the imperial system. Exploitation of

<sup>56</sup> See, for instance, Jeremy Adelman, 'The Problem of Persistence in Latin American History,' in J. Adelman (ed.), *Colonial Legacies: The Problem of Persistence in Latin American History* (New York, 1999), pp. 1-13.

silver allowed the growth of commerce and industry that otherwise would have been impossible.

## APPENDIX

This appendix considers the determination of total output in Equation 1 from two simple disequilibrium models. The first corresponds to the text-book model in the determination of total output from aggregate demand. The second is an application of the Harrod-Domar model and the balance of payments constraint, in which exports serve to import foreign inputs.

### 1. *Aggregate Demand*

To simplify, let us omit investment and changes in relative prices. The aggregate demand approach assumes that demand for domestic goods is a share  $\varepsilon$  of New Spain's income. Therefore, the marginal propensity to spend in domestic goods must satisfy  $\varepsilon = (\rho - 1)/\rho$ , and the marginal propensity to spend on foreign goods satisfies:  $(1 - \varepsilon) = 1/\rho$ . The utility function behind these assumptions is the Cobb-Douglas:

$$U = D^\varepsilon \cdot Z^{1-\varepsilon}$$

where  $D$  indicates the consumption of domestic goods, and  $Z$  indicates the consumption of foreign goods. Assuming silver is only used foreign goods, then the equilibrium in the international market would be  $Z = X$ , and the level of output in New Spain would be determined by aggregate demand  $Y = D - Z$ .

In this case,  $\rho$  in Equation 1 is the multiplier of silver exports. And then,  $1/\rho$  is the share of silver in total output, which if we assume equal to 8 per cent, then an additional 'peso' would lead to an increase of 12.5 pesos in total output. With this approach in mind, Equation 1 should be deflated to form a correct idea about real output.

### 2. *Production Function and the Balance of Payments Constraint*

Now we consider the aggregate production function:

$$Y = \min \{a_C \cdot C, a_L \cdot L\}$$

where  $C$  represents an intermediate good used for domestic production, whereas  $L$  is the amount of labour available in the economy. The requirements of the intermediate good and of labour are  $a_C$  and  $a_L$ , respectively. Let us assume an excess in labour in the domestic economy, and that the

intermediate good is imported. That is,

$$C = s \cdot Z$$

Let us omit the changes in the prices of imported goods. According to the previous equation, a share  $s$  of imports corresponds to the imported input used in domestic production. Again, international equilibrium is achieved with  $Z=X$ . In this case we have  $\rho = s \cdot a_c$  in Equation 1. Our assumption on excess labour would be satisfied as long as silver production is such that

$$X < \left( \frac{a_L}{s \cdot a_C} \right) \cdot L$$

In this model, silver production in Equation 1 does not need to be deflated as long as there are no changes in the prices of Mexican imports.